Woodbury University School of Architecture

Visualization 2: Analytical Constructions

ARCH 563

Semester: Spring 2020

Time: Monday / Wednesday 9:00-11:30

Location: MH204

Instructors: Mark Ericson
Email: mark.ericson@woodbury.edu
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Office hours: Wednesday: 1 – 3pm
Thursdays: 10-12pm

Catalog Description

Credits 3.00. Architectural representation is composed as spatial enabler and interpreter that establishes and conveys perspective. Engagement occurs through two- and three-dimensional analog and digital hardware and software. Prerequisite: Visualization 1

Learning Outcomes

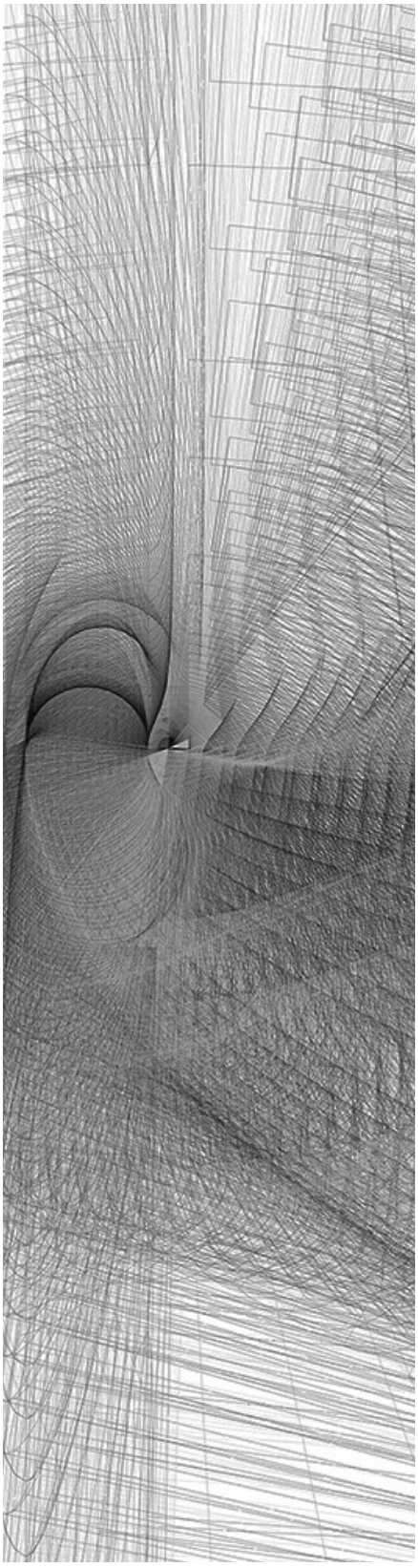
_Method: The ability to expand the design methods demonstrated in class to produced individualized solutions.

_Technical: The ability to construct organizes and clear visual scripts to control geometry, drawings, animations and objects.

_Research: The ability to examine sources beyond the course bibliography and integrate them into the development of the project.

_Craft: The ability to construct precise drawings and objects that critically deploy line weight, color, line-type and material

_Professionalism: The ability to organize, attend, present, and participate in reviews, lectures, and discussions.



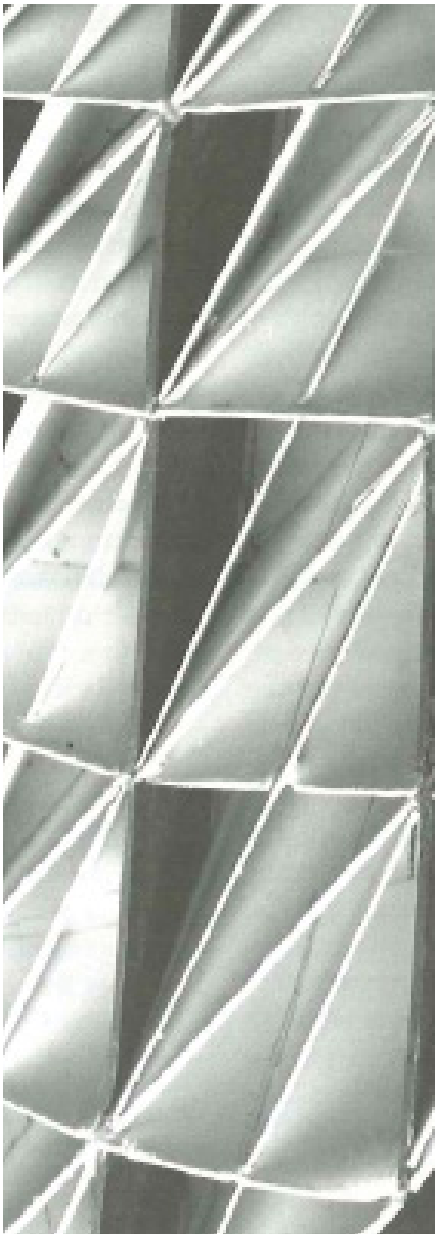
Noor Begum, 2020

ANIMATING ORTHOGRAPHY

Animating Orthography argues for the projective role of history in the implementation of technology in architecture. It focuses on the most ordinary type of architectural drawing, orthographic projection, and speculates on its potential to be re-imagined as a digital process. Orthographic projection has existed since the 15th century, becoming the definitive geometry of drawing in architecture in the early 16th century. Contemporary architecture has displaced orthographic drawing from its traditional place of importance because digital architecture's founding myths deemed it incompatible with the ambitions of digital form. Yet orthographic drawing persists, mainly through the bureaucracies of academia and practice. Architects therefore have two choices: cleanly sever the link to this 400-year-old technique, or try to reconcile it with contemporary ambitions. This course proposes the latter through the analysis and subsequent translation of 17th century orthographic projection into digitally animated drawings.

In contemporary architectural education and practice, an orthographic drawing is a required document. Plans, sections, and elevations fill both drawing sets and the galleries of architecture schools. In most cases, these drawings are not the outcome of the process of orthographic projection, but rather outputs of a command that creates an orthogonally projected image of a digital model. Orthographic projection is now not a drawing practice but a digital operation that translates information from a three-dimensional space to a two-dimensional plane. It is a process of visualization, translating a set of information into a measurable image. It comes after the fact, providing information that helps to describe an object in lieu of generating the object itself. This has not always been the case. Orthographic projection was developed as a means of both generating and controlling architectural form. In one of its earliest uses, stonemasons practiced a form of orthographic projection that enabled them to describe complex forms in stone, both at the level of the whole (the vault) and the part (the individual stone). These drawings, described as stereotomic since the 17th century, came before form. Their job was not to represent something defined elsewhere, but rather to generate the form itself in purely metric terms, leaving the task of representation other methods of documentation. Orthographic projection, at its onset, was a drawing method focused on the production and metric description of form. It computed form as much as it represented it.

This semester we will investigate orthographic projection as a form of drawing computation. We will study the principles of orthographic projection and translate them into computational models capable of producing a range of drawings and objects. We will speculate through drawing and computation on the potential of orthographic projection to be reimagined as a digital process. Students will learn to use Grasshopper and the programming language of Python to create animations, drawings, and objects that are products of the rich overlap of history and technology.



Detail: Inverting a Sine Wave,
John Pickering, 2006

The Drawing

The semester will begin with a study and development of the techniques of drawing exemplified in Guarino Guarini's Architettura civile (1735). Planes, cones, spheres, and cylinders will be reduced to sets of two-dimensional relationships and then redeployed as instruments of distortion. All students will begin with the semi-circle as the point of origin, and will build increasingly complex methods of distortion from the initial set of operations acquired from the study of Guarini. These drawings will then be used to build a model from sheet materials. Students will develop a clear graphic hierarchy that will help to clarify or intensify relationships present in the drawings and model.

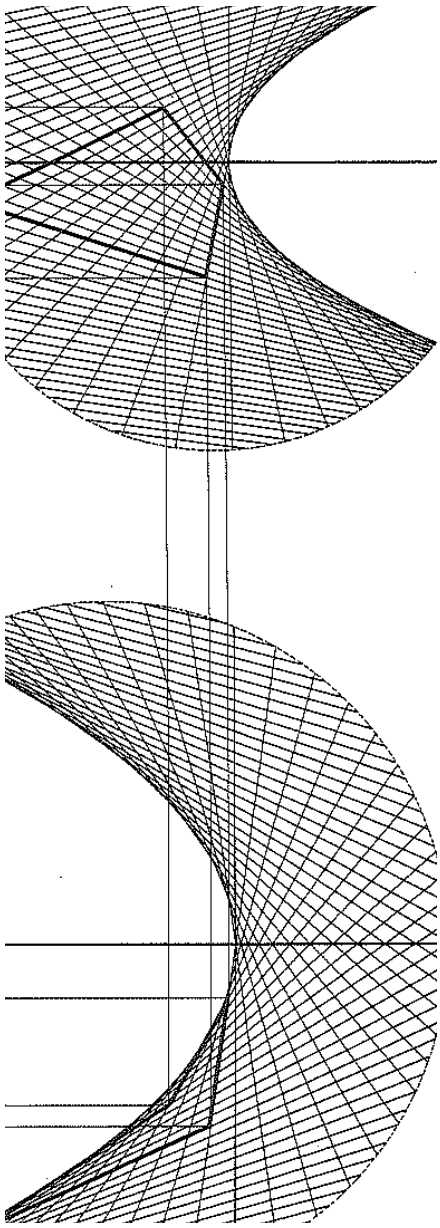
The Animation

The drawings processes from the first project will be expanded to include other forms of motion. In addition, students will now begin work on the development of animation that documents the drawing process and the generation of form. Printed drawings will be created as "stills" from the larger animation in which the development of form from orthographic projection is documented. The

orthographic process will be used as means of computing three-dimensional form. Instead extracting an orthographic image from a complete digital model, students will extract coordinates from their orthographic drawings and use them to constitute a digital model.

The Object:

The final phase of the semester will focus on the translation of the animation into a physical object. The focus of this stage will be the manner in which the geometry and techniques used to generate the form are translated into strategies for fabrication. The animations and drawings from the previous stage will continue to be developed in relation to the production of a final object.



Detail: Hyperbolic Paraboloid
Eduardo Catalano and Gloria Catalano1965

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SOFTWARE EDUCATION

Students will be provided with detailed tutorials in class, but it is both expected and required that students research and acquire technical expertise outside of class. This is a central component each students continued development in architecture. Software does not last long. It is necessary learn new tools on a regular basis. We will primarily use Grasshopper and Rhino along with the Adobe CC suite. Here are a few resources.

Grasshopper Forums:

Use the forums to receive help in problems and share your knowledge with others:
https://discourse.mcneel.com/c/grasshopper

Python for Rhino Primer

This text is not for the Python interpreter in Grasshopper, but it is a good start for understanding the role of python in controlling and implementing Rhino’s native rhinoscript sytntax.

The Grasshoper Primer:

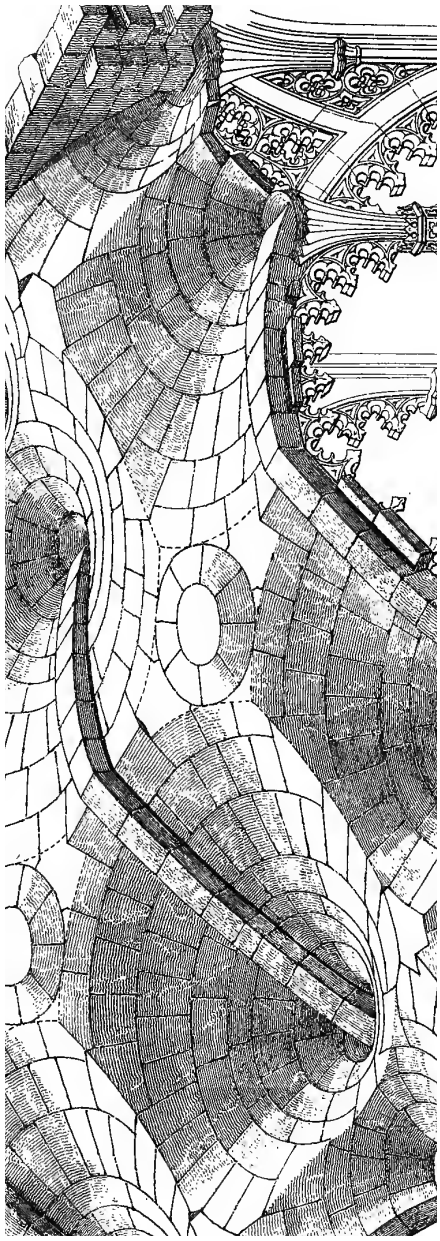
The Grasshopper Primer by Andrew Lyft is now somewhat outdated but its basic principles and organization still operate as a great introduction: http://www.liftarchitects.com/blog/2009/3/25/grasshopper-primer-english-edition

Grasshopper Tutorials:

Grasshopper maintains an extensive list of links to free tutorials and primers.
https://www.grasshopper3d.com/page/tutorials-1

Software tutorials on Lynda:

If you obtain a Los Angeles Public Library card you can get free access to the tutorials on Lynda.com. This a good resource and it is free.
https://www.lapl.org/collections-resources/online-learning



Detail: On The Construction of Vaults in the Middle Ages
Robert Willis, 1842

ACTIVITIES, PROCESSES, AND ASSIGNMENTS:

Students are expected and required to complete work outside of class through design investigation and research. It is highly recommended that students work in studio to complete this work. Studio is a laboratory of creative thinking. Students who surround themselves with other students working towards the same objective will advance in ways that are not possible if work is done in isolation. Studio discussions and reviews are directed toward the establishment of critical discourse of issues and investigations. Students are expected to be prepared to participate in discussion.

The class will work in within the following settings:

Lecture:

Lectures will take approximately thirty minutes during which time the students and instructor will engage in a discussion regarding the information being presented. Student’s verbal participation in lectures is required.

Review//Pin-up:

Reviews will consist of oral and graphic presentation of individual projects. Students will be required present a coherent architectural argument at every review. Presentations are not only the

evaluation of student progress, but a time of critical discourse between all students and instructors. Student participation is both encouraged and required.

Lab:

Students must come to class with the materials on the required list for all scheduled class times. During workshops specific skills and concepts pertaining to the assignment at hand will be demonstrated and tested. Successful participation and completion of each lab is required.

Drawing/Printing/Modeling

All of the drawings done during the course of the semester will be digital. In order to receive feedback and improve on the technical and conceptual aspects of drawing students will be required to print each week. Students should budget approximately $150 for printing for the entire semester and 150$ for modeling.

Software:

The studio will require the use of the following software: Rhino 6 Grasshopper (Latest Build), Adobe Illustrator CS6, Abobe In-Design CS6, Adobe Photoshop CS6.

Digital Submissions:

Students will be required to submit PDF and GH formats of their work at the termination of each of the (3) project phases. Work submitted for these purposes should not exceed 50 mb per file. Please use the following naming conventions when submitting digital work:

ARCH_XXX_Semester_Assignment_num_Lastname_Firstname.pdf.

Reading:

Students are expected to complete the reading and be ready to discuss it on the class following its assignment.

ASSESSMENT OF STUDENT PERFORMANCE:

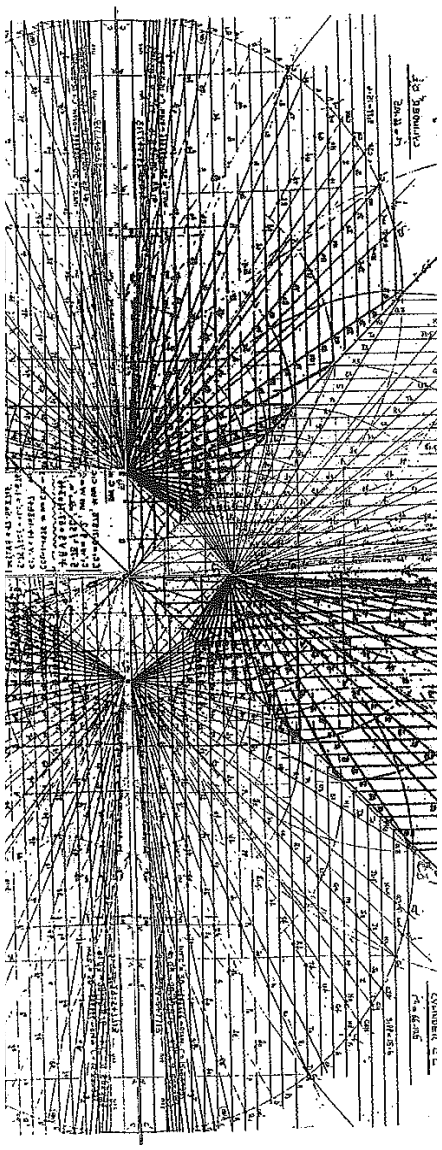
Review 1: 33.3%

Review 2: 33.3%

Review 3: 33.3%

RUBRICS:

Major activities, processes, and assignments will be evaluated using tailored rubrics that explain the criteria for determining student performance. Individual rubrics will be distributed at the introduction of each assessed activity, process, and assignment. Student work will be evaluated based on the following criteria.



Detail: Inverting a cylinder with respect to a point not lying on the cylinder
John Pickering

_Method: _Method: The ability to expand the design methods demonstrated in class to produced individualized solutions. As demonstrated through the iterative production of drawings and models and the response to feedback.

_Technical: The ability to construct organizes and clear visual scripts to control geometry, drawings, animations and objects. As demonstrated in a legible and visual script.

_Research: The ability to examine sources beyond the course bibliography and integrate them into the development of the project. As demonstrated by textual, material, formal, conceptual, or organizational connections between the research and the artifacts of design.

_Craft: The ability to construct precise drawings and objects that critically deploy line weight, color, line-type and material

_Professionalism: The ability to organize, attend, present, and participate in reviews, lectures, and discussions.

Expectations and Requirements:

Digital Submissions:

Students will be required to submit PDF of their work at the termination of each of the (4) assignment Work submitted for these purposes should not exceed 50 mb per file. Each submission should include professional quality photograph of all models. AB108 has a backdrop and lighting for this purpose. Students will not receive credit for work that is not submitted. The deadline for these submissions is shown on the course syllabus. Work that it is submitted after the deadline will receive a letter grade deduction for each day the work is late. Please use the following naming conventions when submitting digital work:

ARCH_XXX_Semester_Assignment_num_Lastname_Firstname.pdf.

Attendance:

Important announcements, changes, and tutorials may occur spontaneously, attending class and arriving on time is an important part of successfully completing the studio. Students are expected to be on time and present for the entire duration of every class. Absence, tardiness and lack of participation in class will be directly reflected in your grade for " Professionalism". Each un-excused absence will result in a (1) point deduction in the category of "Professionalism" for the assignment in which it occurs. Arriving to class late by more than 15 minutes (1:30pm) without prior notification may result in a (1) point deduction in the category of Professionalism. If you are working in the computer lab, please check in with your instructor at 1:15 to see what the day's activities entail.

Review / Pin-up preparedness and Participation:

Students are required to attend and participate at critiques, pin-ups and reviews for their full duration. For reviews, work must be pinned up at the designated time and no less than 10 minutes before the scheduled deadline. Students who have not pinned up 10 minutes prior to the deadline will receive a (1) point deduction in the category of "Professionalism" and will not be permitted to present on the day or review. Students must remain at the review for the presentations of the entire class. Failure to remain present will result in a letter grade deduction in the category of "Professionalism". Students who fail to attend a review will receive a grade of "0" for the Category of "Professionalism".

SCHEDULE:
(Subject to change at the discresion of the instructor)

Week	Date	Assignment	Reading	Skills
1	1.13 1.15	The Drawing Introduction to Orthographic Projection and Grasshopper. User interface, lists, trees, Graphic strategies in Grasshopper and exporting drawings. Introduction to Python interpreter and relationship to Rhinoscript.	Robin Evans, "Translations from Drawing to Buildings," in Translations from Drawing to Building (Cambridge: MIT Press, 1997), 153–89.	Line weight and type, Euclidian geometry, orthography, stereotomy, Computation
2	1.20: NO CLASS 1.22: Workshop/ Pin-up	The Drawing The orthrographic projection of a semicircle onto planar surfaces. Vault terminology, timing and recording operations in grasshopper. Adding notation to drawings.		Line weight and type, Euclidian geometry, orthography, stereotomy, Computation
3	1.27: Workshop 1.29: Pin-up	The Drawing The orthographic projection of a semicircle onto curved surfaces. Building switches in Python to control variations.		Line weight and type, Euclidian geometry, orthography, stereotomy, Computation
4	2.03: Workshop 2.05: REVIEW 1	The Drawing Graphic strategies in Grasshopper: scale, vector, raster, color		Line weight and type, Euclidian geometry, orthography, stereotomy, Computation
5	2.10: Submit Digital 2.12: Lab/Pin-up	The Animation Image capturing in Grasshopper. Strategies generating motion. Projection onto Conoidal, spherical, and toroidal surfaces.	May, John. "Everything Is Already an Image." Log, no. 40 (2017): 9–26.	orthography, stereotomy, Computation, Animation
6	2.17: NO CLASS 2.19: Lab/Pin-up	The Animation Image capturing in Grasshopper. Strategies generating motion. Projection onto Conoidal, spherical, and toroidal surfaces (continued)		orthography, stereotomy, Computation, Animation
7	2.24: Lab 2.26: Lab/Pin-up	The Animation Strategies for the introduction of timed interruptions and changes to grasshopper.		orthography, stereotomy, Computation, Animation

8	3.02: Desk Crit 3.04: Lab/Pin-up	The Animation Processing the Animation in After effects. File formats, file size, resolution			orthography, stereotomy, Computation, Animation
9	3.09: NO CLASS 3.11: NO CLASS	SPRING BREAK			
10	3.16: Lab 3.18: Review 2	The Animation Refining the animation			orthography, stereotomy, Computation, Animation
11	3.23: Submit Digital 3.25: Lab/Pin-up	The Object Defining the voussoirs. Three-dimensional modeling in Grasshopper. Building three-dimensional form from values extracted from the orthographic drawings. M		Cache, Bernard, "Towards a Non-Standard Mode of Production," in Projectiles, Architecture Words 6 (London: AA Publications, 2011), 60–73.	computational modeling, axonometry, fabrication
12	4.30: Lab 4.01: Lab/Pin up	The Object: Building the voussoirs. Intersecting, Splitting, and unrolling surfaces in Grasshopper. Developing plans and sections in Grasshopper: Cutting planes, Make 2D, Rendering.			computational modeling, axonometry, fabrication
13	4.06: Lab 4.18: Lab/Pin-up	The Object Strategies of assembly. Prepping files for laser cutter: single line text, organization. 3D printing connections strategies.			computational modeling, axonometry, fabrication
14	4.13: Lab 4.15: Lab/Pin-up	The Object Strategies of fabrication.			computational modeling, axonometry, fabrication
15	4.20: Lab 4.22: Lab/Pin-up	The Object Strategies of fabrication			computational modeling, axonometry, fabrication
16	4.27: Lab	Closing discussion			computational modeling, axonometry, fabrication
17	5.07: FINAL 5.09. Submit Digital				

DEPARTMENT POLICIES AND PROCEDURES

Requirements for Documentation and Archiving
Every student is responsible for digitally archiving their work. An assignment that has not been digitally archived will be considered incomplete and will not receive credit. Please use the process provided by your instructor to produce a single PDF document for each assignment. Failure to submit the required documentation in usable format may result in a grade reduction in the final grade of the semester. Documentation of the studio work is essential for the NAAB accreditation process and assessment of the architecture program.

The university reserves the right to retain student work for archival purposes. Projects/models, assignments, and exams will be kept at the department's discretion for this purpose. Students will be asked to help with archiving their projects at the end of the semester.

Writing Requirements
All written work must meet the standards for English. Poorly written papers may be returned without a grade for revision and resubmission, and may be subject to grade reduction. Students are encouraged to utilize the Woodbury Writing Center.

Studio Culture
The studio environment is an essential component in learning to become an architect. One goal of the School of Architecture is to create a vibrant, exploratory, safe and respectful learning culture for students. Only through respect between faculty and students, as well as students among themselves, can a healthy educational studio culture be fostered. Students are required to uphold high standards of behavior and academic discipline while in the studio. See the full Studio Guidelines and Studio Culture Policy for more information.

School Policy on Social Equity and Diversity
Our mission is to provide an environment where people can learn, teach and work with a shared sense of purpose, core values and respect without bias towards individual beliefs, values and areas of difference. We do this in an effort to create a community that respects and values the full and equal inclusion of its members. Our goal is to provide an environment that is welcoming and inclusive of all.

Accommodations for students with identified disabilities
Woodbury University is committed to making reasonable accommodations to assist individuals with disabilities in reaching their academic potential. Students desiring accommodations due to a physical, learning or psychological disability must first complete an Accommodations Request Form, which can be downloaded from http://go.woodbury.edu, and found under "Academic Resources." Accommodations cannot be granted prior to the instructor's receipt of a Notification of Special Needs Release Form from the Disabilities Coordinator. Accommodations are never provided retroactively. (For more information, contact the Disabilities Coordinator in the Whitten Center (818) 394-3345.)

Academic Honesty
Because the integrity of the academic enterprise of any institution of higher education requires honesty in scholarship and research, academic honesty is required at Woodbury University. Academic integrity is important for two reasons: first, independent and original scholarship ensures that students and scholars derive the most from their educational experience and the pursuit of knowledge. Second, academic dishonesty violates the most fundamental values of a community of scholars and depreciates the achievements of the entire University community. Accordingly, Woodbury University views academic dishonesty as one of the most serious offenses that a member of our community can commit. Adherence to the Academic Honesty Policy reflects the commitment of our community to the ideals of learning, research, and scholarship. See Catalog for the entire Academic Honesty Policy.

Grade Requirements
Refer to the Woodbury University catalog for grading standards and policies.

Environmental Responsibility
Studio projects shall be designed in a socially and environmentally responsible manner. All projects should reduce dependencies on non-renewable resources.

Class Attendance
It is mandatory that students take advantage of all scheduled course time. Regular attendance at EVERY class is expected throughout the duration of the class/studio time. Arrival at the beginning of the class period is required. Lateness or early departure will be considered as an absence. Regular and prompt attendance at all university classes is required. The instructor is not obligated to assign extra work or to prepare additional examinations for classes missed. It is understood that when 15% of the class time has been missed, the student's absence rate is excessive. Each instructor will announce his/her attendance policy in the course syllabus.

Excused Absence
Students should report any illness or emergency to their course instructor, preferably before missing the class, by emailing the instructor. Written documentation (doctor's note, etc.) is required for an excused absence, and should be submitted to the instructor at the next class meeting. Extended absence due to medical issues, family issues, etc. should be reported to the Dean of Students' office for appropriate documentation.

Students who anticipate absence due to religious observance or similar commitments should speak with their instructor at the start of the term to review all dates in question and develop a plan to meet all course requirements.

Email
Students are advised to meet with their instructors during posted office hours. Face-to-face communication in discussing and resolving problems is preferable to email exchanges. Additionally, meetings must be scheduled in advance using email correspondence. Email correspondence must be written in a respectful and professional manner. It is the student's responsibility to consistently check for email.

Grievance Protocol
Students should use the following protocol for questions, grievances, or general concerns about coursework and the studio environment. Health and safety concerns and emergencies should immediately be directed to campus security (818-252-5208). Academic concerns should be directed first to the student's instructor, and then to the studio coordinator as appropriate. If further consultation is required, the student is advised to meet with the Coordinator and/or the Department Chair.

Class Syllabus and Structure
While every effort will be made to follow the outline of the published syllabus, course structure and calendar may be changed at the instructor or coordinator's discretion. Announcements will be made if such changes occur. Students who miss class are responsible for tracking any such announcements.

Calculation Of Grade
Letter grades are converted to numeric values using the following values:

Letter	GPA	%	Definition
A	4.00-3.84	96-100	Student learning and accomplishment far exceeds published objectives for the course/test/assignment and student work is distinguished consistently by is high level of competency and/or innovation.
A-	3.83-3.50	92-95	
B+	3.49-3.17	88-91	Student learning and accomplishment goes beyond what is expected in the published objectives for the course/test/assignment and student work is frequently characterized by its special depth of understanding, development, and/or innovative experimentation.
B	3.16-2.84	84-87	
B-	2.83-2.50	80-83	Students learning and accomplishment meets all published objectives for the course/test/assignment and the student work demonstrates the expected level of understanding, and application of concepts introduced.
C+	2.49-2.17	76-79	
C	2.16-1.84	72-75	
C-	1.83-1.50	68-71	Student learning and accomplishment based on the published objectives for the course/test/assignment were met with minimum passing achievement.
D+	1.49-1.17	64-67	
D	1.16-0.60	60-63	
F	0.00-0.60	< 60	Student learning and accomplishment based on the published objectives for the course/test/assignment were not sufficiently addressed nor met.